

VEGETATION INVENTORY OF CURRENT AND HISTORIC BLACK-FOOTED FERRET HABITAT IN WYOMING

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ABSTRACT.—A vegetation inventory of current and historic black-footed ferret (*Mustela nigripes*, BFF) habitat was completed in the 1983 growing season. White-tail prairie dog (*Cynomys leucurus*) colonies near Meeteetse, Wyoming, provide the only known BFF habitat. Four other prairie dog complexes located in Wyoming, documented historic BFF habitat, were also inventoried. Prairie dog burrows occur in two of eight vegetation types present in the current BFF habitat study area. They are junegrass (*Koeleria cristata*) and sagebrush/junegrass (*Artemisia tridentata*/ *K. cristata*; named for dominant species). In historic BFF habitat, prairie dog burrows occur in six vegetation types: birdfoot sagewort/western wheatgrass (*Artemisia petadifida*/*Agropyron smithii*), alkali sagebrush (*Artemisia longiloba*)/ mixed grass, Gardner saltbush (*Atriplex gardneri*)/ mixed grass, and thickspike wheatgrass-threadleaf sedge (*Agropyron dasystachyum*-*Carex filifolia*), mixed shrub/mixed grass, and Gardner saltbush. Similarities among all five complexes are plant heights generally less than 66 cm, level to gently rolling topography, and severe disturbance due to historical grazing, vegetation manipulation, and other human-related activities. Of the vegetation parameters measured, only plant height appears to be important to white-tail prairie dog distribution. White-tail prairie dog colonies do not appear to depend on a particular vegetation type; consequently, vegetation type alone should not be used to identify BFF habitat.

A comparative vegetation inventory including cover, shrub density, and plant height measurements with qualitative field observations of current and historic BFF habitat was completed in summer 1983. This study was

conducted as part of a comprehensive program designed to identify parameters important to the selection of potential BFF relocation sites. This paper presents results of the study.

TABLE 1. Location of five study sites in Wyoming.

White-tail prairie dog complex	County	Legal location
CURRENT FERRET HABITAT		
1. Meeteetse complex		
Core Colony ¹	Park	T48N R102W; T48N R103W
91 Colony	Park	T48N R102W; T48 ¹ / ₂ N R102W
Pickett Creek Colony	Park	T48N R103W
Thomas Colony	Park	T48N R102W
Lower Bench Colony	Park	T48N R102W; T49N R102W
Tonopah Colony	Park	T48N R102W
Pump Station Colony	Park	T48N R102W
BLM-13 Colony	Park	T49N R102W
Island Colony	Park	T48N R103W
Graveyard Colony	Park	T48N R103W
Timber Creek Colony ² (abandoned)	Park	T48N R102W; T47N R102W
HISTORIC FERRET HABITAT		
2. Larsen's Ranch Complex	Sweetwater	T22N R93W
3. Wasmer Flats Complex	Uinta	T16N R118W
4. Gillies Draw Complex	Park	T47N R95W; T48N R98W
5. Horne Flats Complex	Carbon	T22N R75W; T21N R78W

¹Prairie dog colony names follow Forrest et al. (1985).

²No evidence of BFF occupancy 1981–1984; probably poisoned and abandoned in 1960s.

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TABLE 2. Summary comparison of important descriptive parameters for the five study sites.

Prairie dog complex	Vegetation type	Total cover (%)	Shrub density (stems/m ²)	Plant height (cm)	Elevation (m)	Topography
CURRENT FERRET HABITAT					2134–2256	Rolling hills and flat benches
1. Meeteetse Complex						Level to SW-facing; 0°–3° slope
Core Colony	Junegrass	73	0.3	13–46		
	Sagebrush/ Junegrass	67	1.3	21–62		
91 Colony	Junegrass	63	1.3	15–31		Level to gently sloping; 0°–6° slope
Pickett Creek Colony	Junegrass	74	0.4	15–31		Level to gently sloping S-facing; 0°–2° slope
Thomas Colony	Junegrass	65	1.5	31–46		SE-facing; gentle slope
Lower Bench Colony	Junegrass	73	0.6	31–46		SW-facing; 0°–2° slope
Topopah Colony	Junegrass	73	1.3	18–62		E-facing; gentle slope
Pump Station Colony	Junegrass	72	1.3	16–62		Level to gently sloping valley
BLM-13 Colony	Junegrass	83	0.4	31–62		Nearly level
Island Colony	Junegrass	71	0.4	15–51		Nearly level
Graveyard Colony	Junegrass	71	0.1	15–62		Nearly level
Timber Creek Colony (Abandoned)	Junegrass	73	0.4	31–51		Nearly level
HISTORIC FERRET HABITAT						
2. Larsen's Ranch Complex	Birdfoot sage/grass	39	2.5	5–31	2042	Level; 0°–10° slope
3. Wasmer Flats Complex	Alkali sagebrush	53	1.3 (live) 0.7 (dead)	5–62	2095	Level to gently sloping
4. Gillies Draw Complex	Gardner saltbush	58	0.8	8–92	1652–1808	Highly dissected; series of parallel draws and ridges
5. Horne Flats Complex					2042	Extensive, level bench
	Wheatgrass-sedge	66	1.1	26–41		
	Mixed shrub/grass	59	1.7	31–36		
	Gardner saltbush	56	1.6	10–41		

¹Becker and Aylea, 1964a²Becker and Aylea, 1964b³G = Grazed

PL = Pipeline

PW = Powerline

OW = Oil well

TL = Transmission line

METHODS

Ten of 33 white-tail prairie dog colonies utilized by BFF's and an abandoned colony near Meeteetse, Wyoming (Forrest et al. 1985), were arbitrarily selected for study (Table 1). Four historic BFF habitat sites (Larsen's Ranch, Wasmer Flats, Gillies Draw, Horne Flats; Table 1) were selected for comparison with the current BFF habitat site at Meeteetse. Historic habitat was identified based on the presence of BFF skeletal remains or sign (Martin and Schroeder 1979, 1980, Clark 1980, Clark and Campbell 1981).

All five sites were similarly inventoried. Vegetation type units were delineated on 7.5 minute USGS topographic maps during field reconnaissance and named based on aspect dominance. Sampled types were later re-named for the dominant-co-dominant species.

Thirty randomly selected plots per vegetation type containing prairie dog burrows were sampled in each of the 11 mapped Meeteetse colonies. Colony boundaries within the four historic BFF habitat sites were not delineated for the authors, and no attempt to do so was

Mean monthly temp. extremes (°F) ¹		Mean annual precipitation (cm) ²	Disturbance ³	Additional vegetation types present not containing burrows
High	Low			
45	21	43.9	G; PL; OW; TL G; PL G G G G; PL G; PL; PW G G G	Mixed shrub; mixed grass; riparian; greasewood; rabbitbrush; wet meadow Wet meadow
47	7	16.7	G	Sagebrush
43	4	27.0	Sprayed; G	Western wheatgrass playa; sagebrush
45	21	43.9	G; TL	Sagebrush; greasewood
67	21	26.7	G; PL; TL	Sagebrush

made in the field. Rather, vegetation types within the arbitrarily designated study sites were mapped as previously described, and only those types containing burrows were sampled. A minimum 30 plots per vegetation type containing prairie dog burrows was sampled at each of these four complexes, with plots randomly distributed throughout several colonies within each complex. Additional plots were sampled when required to meet sample size adequacy as defined by the Wyoming Department of Environmental Quality (1979). A 0.5 m x 2.0 m frame was used to

delineate plot boundaries. Percent bare ground, litter and rock, and cover by species were determined by ocular estimate. Shrub density was sampled using a 4.0 m x 4.0 m plot located at one corner of the 1 m² plot. Number of stems and height measurements were recorded for each shrub species rooted in this plot.

Floristic inventories were made of all five complexes. Additional qualitative observations, including past and current disturbance, degree and source of disturbance, soils, topography, relative abundance and distribu-

TABLE 3. Summary cover and shrub density data for all five prairie dog complexes.

Prairie dog complex	Cover ¹					Density	
	\bar{x} graminoid	\bar{x} forb	\bar{x} shrub	\bar{x} tpc*	\bar{x} bare	\bar{x} litter	\bar{x} shrubs/m ²
CURRENT FERRET HABITAT							
1. Meeteetse Complex							
Core Colony							
Sagebrush/							
Junegrass	39.7	16.2	11.0	66.8	18.7	14.8	1.3
Junegrass	48.2	24.1	1.1	73.4	9.7	17.0	0.3
91 Colony	45.0	9.1	9.1	63.1	29.7	7.6	1.3
Pickett Creek Colony	48.7	23.3	1.8	73.7	10.3	15.7	0.4
Thomas Colony	46.0	13.1	6.0	65.1	31.7	5.4	1.5
Lower Bench Colony	42.8	29.9	1.3	74.1	22.0	6.1	0.6
Tonopah Colony	51.6	12.5	8.6	72.7	21.6	6.0	1.3
Pump Station Colony	44.4	18.3	9.7	72.3	25.8	4.9	1.3
BLM-13 Colony	55.7	25.7	1.9	83.3	10.2	9.2	0.4
Island Colony	46.2	21.2	3.4	70.7	21.8	9.9	0.4
Graveyard Colony	47.3	23.7	0	71.0	18.9	11.6	0.1
Junegrass type mean	47.6	20.1	4.3	71.9	20.2	9.3	0.9
Timber Creek Colony (abandoned)	45.5	25.4	2.2	73.1	19.0	10.1	0.4
HISTORIC FERRET HABITAT							
2. Larsen's Ranch Complex	14.4	6.7	17.4	38.5	58.3	5.0	2.5
3. Wasner Flats Complex	26.0	12.1	14.8	52.9	32.9	16.0	1.3 (live)
4. Gillies Draw Complex	34.3	3.3	20.3	57.8	33.4	9.0	0.7 (dead)
5. Horne Flats Complex							
Grass	45.0	10.9	9.6	65.5	23.6	11.0	1.1
Shrub/Grass	24.1	12.3	22.9	59.4	35.6	5.4	1.7
Saltbush	13.0	17.5	25.9	56.3	39.8	4.3	1.6

¹Percent aerial cover

*Total plant cover

tion of prairie dog burrows, and community structure, were also recorded.

RESULTS

Current BFF Habitat

MEETEETSE.—This 3887 ha site is located about 10 km northwest of Meeteetse, Wyoming. It is characterized by extensive, gently rolling, grassy benches ranging in elevation from 2134 m to 2256 m. Soils are medium textured, contain less than 50% coarse fragments, and are either deep (128–154 cm) or underlain by soft or unconsolidated geologic material (Meyer 1983, personal communication) (Table 2). Primary land use is domestic livestock grazing.

Eight vegetation types occur in the BFF-occupied study site. They are greasewood (*Sarcobatus vermiculatus*), wet meadow, rabbitbrush (*Chrysothamnus nauseosus*), mixed shrub, riparian, mixed grass, junegrass (*Koeleria cristata*), and sagebrush/junegrass (*Artemisia tridentata*/K. *cristata*). Only the latter two types contain prairie dog burrows.

Ten of the 11 colonies lie entirely within the junegrass type, whereas one, Core Colony, is vegetated by the junegrass and sagebrush/junegrass types (Tables 2, 3). Mean total plant cover for the BFF-utilized junegrass type ranges from 63 % to 83 % aerial cover, with grasses the dominant species. The BFF-utilized sagebrush/junegrass type has a mean total plant cover of 67%, with sagebrush the dominant shrub (Tables 3, 4). Plant heights range from 13 to 62 cm in these two types. The Timber Creek Colony was probably poisoned and abandoned 10 to 20 years ago (Clark 1985, personal communication). Plant cover and shrub density values for the junegrass type in which this colony lies are all within corresponding value ranges of the BFF-occupied prairie dog colonies. Species composition and plant heights are also similar (Tables 2, 3, 4). This may indicate that, unlike blacktail prairie dogs (*C. ludovicianus*) (Bonham and Lerwick 1976), white-tails do not significantly alter vegetation of their colony. However, it was not the purpose of this study to determine such effects.

The junegrass-dominated grasslands may be a result of historical heavy grazing by livestock of native bluebunch-western wheatgrass (*Agropyron spicatum*-*A. smithii*) communities. Historic photographs of the Meeteetse study area at Buffalo Bill Museum in Cody, Wyoming, indicate historic heavy cattle use of the area during various seasons. Changes in species composition similar to those indicated at Meeteetse have been documented in Oregon and Washington (Baker 1983, personal communication).

Historic Ferret Habitat

The four historic BFF habitat sites are discussed separately.

LARSEN'S RANCH.—This 259 ha study site is located about 18 km north of Wamsutter, Wyoming (Table 1). Topography is level to gently sloping uplands with 0° to 10° slope. Mean elevation is about 2042 m (Table 2). Soils are predominantly of the Tresano-Sandbranch, nonalkaline subsoil-Sagecreek complex (Holbrook 1983, personal communication).

Two vegetation types were present, bird-foot sagewort/western wheatgrass and sagebrush (*Artemisia tridentata*). Burrows occurred only in the former, which was characterized by 58% bare ground and 39% total plant cover (Tables 3, 4). Dominant species are those for which the type was named. Plant heights range up to 31 cm.

The area appeared highly disturbed by cattle at the time of sampling. It was trampled and vegetation was often grazed to within 6 cm of the soil. Not far from where a BFF skull was found are an abandoned barn and corral, water troughs, and salt licks around which cattle congregate. The resulting disturbance, however, did not appear to limit prairie dog use of the area.

WASMER FLATS.—This site is located in a north-south trending valley approximately 24 km northwest of Evanston, Wyoming (Table 1). It encompasses about 6323 ha and is characterized by gently to moderately sloping topography (Table 2). Elevation is about 2095 m. Soils are characteristically very shallow to deep sandy, clayey, gravelly, cobbly, saline-alkaline soils on sandstone, shale, tuff, and conglomerate (United States Department of Agriculture Soil Conservation Service 1981). Primary land use is rangeland.

The site is predominantly a complex mosaic of vegetation in which no single species clearly dominates (based on cover). Alkali sagebrush is the shrub with the greatest density (Tables 2, 3) and provides the type with its overall aspect. Total plant cover is 53% (Table 3), with grasses providing nearly half this value. Species providing the most cover include bottlebrush squirreltail (*Sitanion hystrix*), western wheatgrass, Sandberg bluegrass (*Poa secunda*), and alkali sagebrush (Table 4). Plant heights range from 5 to 62 cm. Prairie dog burrows are scattered along the valley bottom and on lower slopes where shrubs occur as scattered individuals or in small clumps. They do not occur in areas that appear to be periodically flooded, such as the western wheatgrass playa at the north end of the study site or in taller vegetation, such as the alkali sagebrush stands on upper slopes and the sagebrush (*Artemisia tridentata*) community at the northern end of the study site.

The entire valley has been sprayed, as is evidenced by the high density of dead alkali sagebrush sampled (Table 4). Spraying appears to have been most successful along the valley bottom and lower slopes, where the greatest number of dead shrubs and lowest live shrub densities were observed. The site is also crossed by several dirt roads and is paralleled by a major highway. These roads allow easy access by humans, who were twice observed shooting prairie dogs from the roadside during the sampling.

GILLIES DRAW.—This site is located approximately 40 km southeast of Meeteetse, Wyoming (Table 1). It is an area of highly dissected topography, characterized by a series of nearly parallel ridges separated by steep-sided valleys. Elevation ranges from 1652 to 1808 m (Table 2). The approximately 12,646 ha study site generally includes Gillies Draw itself and adjacent ridges on the east and west. Soils are typically Cadoma, Cushman, and Ulm soil types (Meyer 1983, personal communication). Primary land use is domestic cattle and sheep grazing.

Vegetation forms a complex pattern. The valley bottom, lower slopes, and isolated level areas support a Gardner saltbush/mixed grass vegetation type. Sagebrush (*Artemisia tridentata*) dominates side-slopes and ridges and

TABLE 4. Dominant plant species¹ sampled in each of the five prairie dog complexes.

Species	Core ⁴	Meeteetse Complex ²							
		91	Pickett Creek	Thomas	Lower Bench	Tonopah	Pump Station	BLM 13	Island
GRASSES									
<i>Agropyron dasystachyum</i>	7, 8		12	6	4	5	10	4	12
<i>Agropyron smithii</i>					5				
<i>Agropyron spicatum</i>		6		8					
<i>Agropyron trachycaulum</i>									
<i>Bouteloua gracilis</i>									
<i>Bromus tectorum</i>									
<i>Carex filifolia</i>						8		4	
<i>Koeleria cristata</i>	10, 21	18	16	13	10	13	11	18	7
<i>Oryzopsis hymenoides</i>									
<i>Poa secunda</i>	6, 11	8	9	6	6	17	18	10	19
<i>Sitanion hystrix</i>									
<i>Stipa comata</i>	4, 0	6	5		15	6		19	5
FORBS									
<i>Artemisia frigida</i>	6, 12	4	11	3	8	4	6	4	7
<i>Astragalus adsurgens</i>					3			3	
<i>Astragalus grayi</i>		2		3			2		
<i>Astragalus spatulatus</i>									
<i>Descurainia pinnata</i>									
<i>Oxytropis deflexa</i>	0, 3		3		3			4	3
<i>Phlox hoodii</i>	4, 4	2	4	3	5	2	3	8	5
<i>Ranunculus testiculatus</i>									
<i>Sphaeralcea coccinea</i>			2						
<i>Vicia americana</i>							2		4
SHRUBS									
<i>Artemisia longiloba</i>									
<i>Artemisia petadifida</i>									
<i>Artemisia tridentata</i>	9, 0	3							
<i>Atriplex gardneri</i>		2		2		6	6		
<i>Chrysothamnus nauseosus</i>	0, 3		1					1	
<i>Chrysothamnus viscidiflorus</i>									
<i>Eurotia lanata</i>		3		2					
<i>Gutierrezia sarothrae</i>	0, .3			2	1			1	
<i>Opuntia polyacantha</i>	0, .3		1						

¹Dominance based on cover; only dominant species listed.

²Current BFF habitat.

³Historic BFF habitat.

⁴Value listed first is for *A. tridentata*/*K. cristata* vegetation type; value listed second is for *K. cristata* vegetation type.

also occurs as stringers along drainages and as small inclusions within the saltbush type. Greasewood (*Sarcobatus vermiculatus*) forms dense stands primarily along the main drainage. Prairie dogs utilize only the saltbush type, where plant heights range from 8 to 92 cm. Total plant cover is 58% (Table 3). Dominant species are Gardner saltbush and a mixture of grasses (Table 4).

HORNE FLATS.—This site is approximately 7 km south of Medicine Bow, Wyoming (Table 1) at an elevation of 2088 m (Table 2). It is an extensive flat bench whose topography and aspect are very similar to those of the Meeteetse study site. Soils have not been mapped.

The study site encompasses about 14,227 ha, although similar habitat and prairie dog colonies are extremely extensive outside the study site boundaries as well. Primary land use is livestock grazing, and areas near water troughs and salt licks are most heavily impacted.

Four vegetation types, thickspike wheatgrass-threadleaf sedge (*Agropyron dasystachyum-Carex filifolia*), mixed shrub/mixed grass, Gardner saltbush, and sagebrush (*Artemisia tridentata*) occur in the study site. Prairie dogs utilize the former three types. Burrows are evenly spaced in the grass type. They are unevenly distributed in the two

Graveyard	Timber Creek	Junegrass Average	Larsen's Ranch Complex ³	Wasmer Flats Complex ³	Gillies Draw Complex ³	Grass-Sedge	Horne Flats Shrub/Grass	Complex ³ Salt bush
10		7						
	8	1	11	7	4	11	9	6
		2		5				3
					5	4	8	
		3				17		
16	19	13				3		
		.3			3			
10	10	12	4	7	8			
				8				
7	5	7				7		
10	7	7					4	
4	2	1						
		1				3		
				2	2			
3	6	2						
	5	4	6	5		6	5	14
				4				
		1						
		1						
				6				
			14		6	7	9	9
		.3					7	
		2	3	3	14			14
		1						
				3				
		1						
	1	1					3	
		.2						

shrub types and appear to be most dense in the Gardner saltbush type.

The thickspike wheatgrass-threadleaf sedge type is the most extensive type in the study site. Total plant cover (Table 3) is 66%, most of which is provided by graminoid species. Plant heights range from 26 to 41 cm. Broom snake-weed (*Chrysothamnus viscidiflorus*) is the predominant shrub. The second most extensive vegetation type is the mixed shrub/mixed grass type, characterized by vegetation 31 to 36 cm tall. Birdfoot sagewort, thickspike wheatgrass, blue grama (*Bouteloua gracilis*), and sagebrush are the predominant species. Total plant cover is 60% (Table 3), with grasses

and shrubs contributing nearly equal cover (Table 4). The Gardner saltbush type occurs in small depressions. Total plant cover is 56%, nearly half of which is provided by shrubs (Table 3). Important species include Hood's phlox (*Phlox hoodii*) and birdfoot sagewort. Plant heights do not exceed 41 cm.

DISCUSSION

Comparisons of measurements and qualitative observations reveal similarities among the five study sites.

1. *Vegetation*. At all five sites, vegetation types in which prairie dog burrows occur are

generally characterized by vegetation of low stature (< 92 cm). This figure represents the tallest plants observed, which usually occur as scattered individuals or clumps. Overall aspect of these vegetation types is one of shorter plants. At the Meeteetse site (current BFF habitat), maximum plant height is 62 cm. The tallest plants are represented by scattered sagebrush or isolated patches of species such as needle and thread (*Stipa comata*), green needlegrass (*S. viridula*), Sandberg bluegrass (*Poa secunda*), and tansymustard (*Descurainia pinnata*). Vegetation of the historic BFF habitat sites is generally shorter than that of the Meeteetse site. The tallest plants observed were scattered tansymustard (92 cm) in Gillies Draw. At all sites mat-forming shrubs, such as birdfoot sagewort and Gardner saltbush, do not exceed 26 cm. Where inclusions of tall shrubs occur, prairie dog burrows are located only on their peripheries.

2. *Burrow Distribution*. When a prairie dog colony lies entirely within one extensive vegetation type, such as 10 of the Meeteetse colonies do, burrows are widely distributed and are about equidistant from one another. When two or more vegetation types occur as a mosaic and only one type is suitable prairie dog habitat, such as at Gillies Draw and Larsen's Ranch, burrows are closer together and distances between them vary. Similar patterns in burrow distribution were observed at all five study sites.

3. *Topography*. All prairie dog colonies sampled occur on level to moderately sloping sites with various exposures. When steep slopes occur, prairie dog burrows are located only in valley bottoms and on lower side slopes, even if a suitable vegetation type follows the steeper slope. This is exemplified best at Gillies Draw, where the Gardner saltbush type occurs over a variety of slopes but contains burrows only where the topography is level or moderately sloping. At Meeteetse a few small, isolated hills exist that support the junegrass vegetation type and are surrounded by burrows at their bases, but burrows are absent from the slopes.

4. *Disturbance*. All sites were disturbed by human-related activities. The Meeteetse site has been variously grazed by domestic livestock for over 100 years. It is crossed by pipelines, transmission lines, fences, and roads. It

supports several oil wells and associated structures, corrals, salt licks, and other ranch structures. The four historic BFF habitat sites have been similarly disturbed. As they all occur on public lands, are relatively accessible, and are presently grazed, it is not unreasonable to assume that they, too, have been used as cattle and sheep rangeland for many years. All are crossed by one or more of the previously mentioned man-made structures. The Larsen's Ranch site is located in a large, active oil and gas field. In addition, the entire valley in which Wasmer Flats is located was sprayed, presumably to reduce shrub cover and increase grass cover several years ago. The site is also easily accessible to humans, who were twice observed by the authors to stop and shoot at prairie dogs from the roadside.

In conclusion, it is obvious that white-tail prairie dogs are not dependent upon a particular vegetation type to meet habitat requirements. They appear to survive equally well in grass, shrub, or shrub/grass types where predominant plant heights do not exceed about 62 cm. They also appear to be extremely tolerant of high degrees of disturbance for long periods of time. Consequently vegetation cannot be considered an important parameter in identifying suitable BFF habitat.

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